

USAWC STRATEGY RESEARCH PROJECT

**OBSERVING AL QAEDA THROUGH THE LENS OF COMPLEXITY THEORY:
RECOMMENDATIONS FOR THE NATIONAL STRATEGY TO DEFEAT TERRORISM**

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ABSTRACT

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Al Qaeda's attack on the World Trade Center and the Pentagon on September 11th, 2003 showed the World that a complex network of individuals, small groups and organizations coupled by a common sense of purpose and enabled by globalization could deliver a devastating attack upon the most powerful nation on Earth. This paper examines al Qaeda through the lens of Complexity Theory, which shows that this organization is a complex adaptive system that emerged as an agent of change within the strategic system of nation states. To defeat al Qaeda, or other complex global terrorist networks, traditional military strategies reliant on nation state frameworks and determination of centers of gravity and decisive points may not be sufficient. Using the characteristics of Complexity Theory, this paper identifies major inputs to expand the current strategy to defeat terrorism. This strategy is focused on diminishing the terrorist network's recuperative and propagative characteristics, enabling the emergence of alternatives to terrorism and redressing the sources of anti-Americanism which fuels the network.

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OBSERVING AL QAEDA THROUGH THE LENS OF COMPLEXITY THEORY: RECOMMENDATIONS FOR THE NATIONAL STRATEGY TO DEFEAT TERRORISM

The first, the supreme, the most far reaching act of judgment that the statesmen and commander have to make is to establish by test the kind of war on which they are embarking; neither mistaking for, nor trying to turn it into, something that is alien to its nature.¹

—Carl Von Clausewitz
On War

The defeat of al Qaeda and the global network of Islamic terrorist organizations often appear no more certain today than it did two years ago. Since 9/11 the world has witnessed terrorist attacks against US interests and its allies in seven different countries. Al Qaeda may have lost Afghanistan as a safe haven, but it has gained a new front by conducting operations against US and coalition forces in Iraq. Despite US military successes, al Qaeda retains a demonstrated ability to recruit and conduct operations globally as Osama bin Laden and many of his most experienced inner circle and associates are still at large.² Although there has yet to be another devastating attack on the US homeland, it is important to remember that the attacks on the World Trade Center and Pentagon took over three years of planning and preparation.³ The lack of a subsequent catastrophic attack in the US since 9/11 is not in itself proof of a successful strategy against terrorism. Despite the efforts of two years of military operations against al Qaeda, the CIA pronounced that al Qaeda still represents the single greatest risk to US national security.⁴ This paradox calls into question the very frameworks, models and tools that US strategic leaders use to develop counter terrorism policy and strategy.

The scientific method, Newtonian physics, modern and Industrial age organizational theory, all reflect reductionist assumptions and paradigms embedded within US strategic concepts and military doctrines that are used to develop responses to terrorism.⁵ Our military doctrine prescribes that strategic planning must first determine our adversary's essential capabilities and characteristics from which it derives its power or freedom of action and then by destroying that "center of gravity", strategic victory is achieved.⁶ Many of the US strategic processes, models and doctrine employ a reductionist and linear analytical methodology, which attempts to reduce an adversary's capabilities and strengths into component parts.⁷ The global terrorist structures of today are not machines or nation states whose component parts are constrained by organizational structures and processes, which can be analyzed with linear reductionist methodologies. Indeed, networks appear to be highly resilient and evolve specifically to survive destruction of its seemingly most vital component parts. Reductionist

models and tools used by today's senior leaders may not by themselves sufficiently clarify the pervasive ambiguity and complexities presented by the threat of anti-American global terrorism.⁸ Conversely, alternative theories that bring into focus networks and dynamic systems may help inform a US strategy to defeat global terrorism.

The alternative theory this paper examines is Complexity Theory, which as any theory, seeks to explain or gain understanding and comprehension of the environment, behaviors and events around us. Theory provides a lens through which to clarify events and behaviors that might otherwise seem clouded and informs our decisions and actions relative to a set of phenomenon.⁹ Complexity Theory views behaviors and actions as the interrelationship between a great many components parts.¹⁰ It refers to these interrelationships or systems as complex, because it is impossible to fully understand these systems by reducing them to an examination of their constituent parts.¹¹ Instead, Complexity Theory holds that interactions produce collective behaviors and characteristics that are not exhibited when the components parts are examined individually.¹² This is in contrast with reductionist theories, which seek to comprehend a phenomenon by examining its individual attributes and are insufficient to understand complex networks.

Using Complexity Theory as a guide, this paper analyses al Qaeda as part of a global anti-American Islamic terrorist network and develops recommendations to improve the US strategy aimed at defeating terrorists from perpetrating further catastrophic acts against the United States homeland. This paper first describes the fundamental characteristics of Complexity Theory. Using these fundamental characteristics as criteria, this paper analyzes al Qaeda's behaviors to support the proposition that al Qaeda is a highly complex and adaptive network and identifies the elements of Al Qaeda's resilience to the current US counter terrorism strategy. Finally, to best inform a strategy against the terrorist network, this paper examines the underlying origins, conditions and sources upon which the network interdependencies emerge. Understanding the sources of these interdependencies provides evidence regarding al Qaeda's fitness and identifies elements to develop a more comprehensive strategy to defeat it.

WHAT IS COMPLEXITY THEORY

Complexity Theory is primarily about the dynamics of networks: it is the study of self-reinforcing interdependent interactions and how much such interactions create evolution, fitness and surprise.¹³

—Russ Marion and Mary Uhl-Bien

Complexity Theory is a relatively new multidiscipline field of study often referred to as the “new sciences”. It greatly expanded over the past two decades in numerous academic disciplines including economics, physics, mathematics, biology, social sciences and other areas.¹⁴ The heightened popularity of Complexity Theory corresponded to the increase in information, communications and computational technology and the proliferation of these technologies across all fields of study and human endeavors.¹⁵ Its gain in popularity is reflective of the current trends in science and technology, where it is often difficult or impossible to reduce behaviors or phenomenon to a small set of properties that characterize its individual components.¹⁶ The widespread interest in Complexity Theory expanded in this period of rapidly advancing technology and globalization where increasing perturbations of dynamic interactions seem to defy traditional reductionist methodology.¹⁷ Instead, Complexity Theory views behaviors as the constantly changing interdependent interactions. These interactions of evolving systems or networks are very different from traditional hierarchical top-down systems as emergence, self-organization and resilience become the three fundamental characteristics of complex networks.

Marion and Uhl-Bien, experts in the field of complexity and organizational theories, described emergence as a phenomenon by which networks are generated from need seeking entities -- called agents.¹⁸ These agents are driven by local assessments and motivated by necessity to couple with other agents forming interdependent relationships to the mutual fulfillment of their individual requirements. Therefore, complex dynamic networks spontaneously propagate and are not created by central deterministic intelligence. Emergence also consists of the phenomenon in which interrelationships between large numbers of disparate agents create collective novel behavior and act as a single purposeful entity. The network exhibits behavior that the constituents could not attain individually. Simply described, a complex dynamic system is always greater than sum of its parts.¹⁹

Stuart Kauffman, a biologist and complexity theorist, determined that self-organization is the fundamental characteristic of complex dynamic networks.²⁰ Five fundamental elements of self-organizing networks are adaptation, correlation, coupling, aggregation and recursion. Complex networks are referred to as “adaptive” or “dynamic”, because they are constantly changing their interrelationships based upon the needs of individual agents and environmental impacts. John Holland, a pioneer in the field of complexity, coined the term “complex adaptive agents” to describe the constantly evolving nature of complex systems.²¹ Individual agents within the network are constantly reassessing their need preferences and the degree to which they will compromise to bond with other agents.²² Consequently, the network adapts through

the process of compromise and competition, called correlation, in which each entity accepts, rejects or changes its relationship with other agents based upon its needs and the changing environment. Kauffman referred to the interdependent bonding of agents as “coupling,” and Marion categorized these relationships as loose, moderate or tight.²³ Tightly coupled agents display high degrees of interdependence, while other sets of agents are described as moderately or only loosely coupled due to low degrees of interdependence. Holland referred that these sets of agents bond through the process of correlation and are united by shared purpose or interest as “aggregates”.²⁴ Aggregates may accumulate with many other sets of agents or structures to form meta-aggregates and further connect with yet other structures that accomplish diverse functions or roles to then form meta-meta-aggregates. This accumulation of aggregates does not imply hierarchy or fixed structures. Instead complex networks are said to be recursive, meaning that through the process of aggregation and correlation the network develops redundant multi-way chains of causality to accomplish its collective interests and contribute to the network’s resilience.²⁵

Resilience is the capability of complex networks to absorb or recuperate from assaults on its constituent parts. The resilience of complex systems can be attributed primarily to its self-organizing characteristic. The elements of self-organization enable a complex network to behave like viruses that spontaneously seek opportunities to spread and adapt in the face of adversity to form more virulent strains.²⁶ In complex networks adaptation is spontaneous, because innovation emerges from the constituent parts rather than a single directing intelligence.²⁷ Complexity Theory implies that hierarchical organizations can never be as resilient as complex networks, because the power of complex networks resides not within its leadership or a few capabilities, but within its ability to spontaneously adapt to changes in the surrounding environment.²⁸ Consequently, multidirectional and redundant pathways of interdependent relationships allow networks to survive assaults on its constituent parts. Furthermore, agents change their levels of dependencies (tight, moderate, or loose coupling) with other agents and aggregates to further enhance their resilience.²⁹ Loosely coupled networks can absorb changes in the environment and assaults on the network due to the low interdependence levels.³⁰ Conversely, tight couplings enhance close coordination and cooperation, but are highly interdependent and as a result they are more vulnerable to disruption.³¹ In summary, complex networks adapt and self-organize to seek the optimal balance of all three types of coupling to enhance their individual and collective performance and resilience.

NETWORK FITNESS DEFINED

The fitness of a network is proportional to its degree of emergence and resilience, or said another way, its ability to self-propagate and recuperate. A fit network has to have three main elements: first it must have a multitude of individual entities; second those entities must be compelled by a need to interact; and third the network must possess a balance of loose, moderate and tight coupling appropriate to its needs.³² The more broad, urgent and widely accepted the need or interest, the larger and more fit the network. Therefore, fit networks can emerge from common need preferences that are neither attainable individually nor provided through other alternatives.³³ A multitude of loose and moderately coupled interrelationships allows network to dissipate the impact of assaults or environmental changes.³⁴ Conversely, tightly coupled networks are vulnerable for disruption, because damage to one part of the network can easily surge across numerous linkages causing network wide damage.³⁵ Likewise, network fitness is vulnerable to alternative structures or other networks that more efficiently or effectively compete for the need preferences of its agents. Faced with other alternatives, some loose and some lesser number of moderately coupled agents will choose to bond with structures that require fewer sacrifices or compromise of their individual need preferences.

AL QAEDA: A COMPLEX DYNAMIC NETWORK

This paper will now examine al Qaeda's behavior using the three characteristics of Complexity Theory described in the previous section to demonstrate that al Qaeda is a complex dynamic network. Analyzing the 9/11 terrorist plot, terrorist financing and al Qaeda's broader organizational behaviors will show that al Qaeda exhibits the characteristics of emergence, self-organization and resilience.

The formation of 9/11 terrorist cells as described by the CIA Director, George Tenant, in Congressional testimony provides a clear example of the emergent nature of the al Qaeda network.³⁶ The 9/11 terrorist cells originated from the ordinary friendship between Muhammad Atta and two other foreign students in Hamburg, Germany in the 1990s. The three were university students from different Middle East countries, and one had been studying aircraft design at the Hamburg School of Applied Science. They met at mosques, coffee houses and local gathering places. Although neither they nor the mosque they attended were known for extremist views, these students were nonetheless drawn together by their increasingly disenchantment with the West in general and the US in particular. They met with other like-minded Muslim men in an ever widening circle of acquaintances, which eventually led them to a German-Syrian named Muhammad Heydar Zammer who was active in Islamic extremist

groups since 1980. About this same time, the terrorists Ramzi Yousef and the Abu Saif group were planning to place timed explosives on passenger airliners bound for the US and use airliners as weapons to fly into the World Trade Center and the CIA headquarters. Yousef discussed his ideas with his uncle Khalid Shaihk Muhammad who was associated with al Qaeda.³⁷ The ideas and concepts for a massive attack on the US using airliners were now emerging among various terrorist groups, and Muhammad Atif, a key associate of Osama bin Laden, studied the idea and discussed it with bin Laden. Thinking the concept had merit, they communicated the idea and provided various resource contacts to several other associates around the globe including Khalid Shaihk Mohammad. About the same time in 1997, through a wide web of acquaintances Mohammed met with Atta and Zacarias Moussaoui, the so called 20th hijacker.³⁸ Coupled with Muhammad and armed with this new idea and some financial and technical contacts, Atta and his associates emerged from a small group of disenchanted university students into a terrorist cell. In total, the plot expanded to include three cells of 19 hijackers with members originating from seven different countries. All but two of the hijackers had no previous associations to religious extremism or terrorist organizations as Tenet lamented that 17 of the 19 plotters were "absolutely clean."³⁹ The 9/11 terrorist cell was not created or directed by a central node or hierarchical apparatus. Instead, the entities within the network were coupled together by loose informal associations forming mutually dependant interrelationships with an ever widening group of like-minded Muslims. Simply stated, the 9/11 cells emerged from the bottom-up.

Organizationally, al Qaeda is intentionally decentralized with recursive operational and financial interrelationships dispersed geographically across numerous associated terrorist organizations that adapt, couple and aggregate in pursuit of common interests.⁴⁰ Operationally, al Qaeda is more accurately a loosely coupled meta-meta-aggregation of like-minded men and organizations united by a common purpose and constantly adapt their interrelationships.⁴¹ The State Department reported that al Qaeda has coupled with at least twenty-eight other Islamic terrorist organizations centered in more than a dozen different countries forming a global aggregation of Islamic anti-American terrorism.⁴² Al Qaeda has long been established with terrorist groups worldwide including the Philippine based Abu Sayyaf, the Egyptian Islamic Jihad, the Moro Islamic Liberation Front, and the Indonesian Laskar Jihad.⁴³ The interrelationships between these groups constantly change. As one French intelligence analyst lamented, "if you have a good knowledge of the network today, it is not operational tomorrow."⁴⁴ Another terrorist expert described the network as "a constantly changing virus that is impossible to totally grasp or destroy."⁴⁵ A previous associate of bin Laden observed that al Qaeda was not

as well organized or orchestrated as some would believe, but rather bin Laden directly controlled only a very small group around him and outside of that were “tens of thousands who are sympathetic and arranged themselves in small groups in a very loose network.”⁴⁶ He further observed that these small groups and other terrorist organizations “didn’t belong to him [bin Laden] like in a pyramidal type of structure.”⁴⁷

The elements of self-organization are also apparent in al Qaeda’s financial apparatus. The Council on Foreign Relations report on terrorist financing concluded that al Qaeda is built upon layers of redundant, diverse and constantly changing financial sources that are incredibly difficult to identify and defeat.⁴⁸ Money to support bin Laden’s terrorist strategy comes from legitimate corporations, individual donations, charitable organizations, profit making terrorist front corporations and criminal enterprises to name but a few sources. Many individuals and corporations donate funds to Muslim charities unaware that funds are illicitly siphoned to support terrorist activities. Terrorist cells and agents are encouraged to seek financial independence and cultivate autonomous forms of income. Al Qaeda’s sources of income spans the spectrum from tightly coupled al Qaeda front corporations to loosely coupled individual donors.

The elements of self-organization are probably most apparent in the 9/11 plot. When the need preference of the Hamburg students intersected those of Bin Laden and other terrorist groups the process of aggregation began. The need for resources and training coupled the hijackers to Khalid Shaikh Mohammad, which facilitated the aggregation process by enabling relationships with al Qaeda. The coupling with al Qaeda facilitated further meta-aggregation with various functional capabilities including financial, technical and training capabilities. These interdependencies exhibited a variety of tight, moderate and loose coupling. The agents within the Hamburg cell exhibited a high degree of tight coupling, as evidenced by the detailed planning and close coordination required to execute the hijackings. Emphasizing the close synchronization of the 9/11 attacks, George Tenet concluded this terrorist attack was unique in the high degree of professional and detailed coordination.⁴⁹ The 9/11 attackers were moderately coupled with bin Laden and al Qaeda. Although al Qaeda provided technical and logistical support, neither bin Laden nor his close associates directly controlled the operation from Afghanistan. Many within bin Laden’s closest circle of associates were never made aware of the plot.⁵⁰ The hijackers’ innovation and adaptation in overcoming many challenges suggest they operated with a large degree of independence and were only moderately coupled with bin Laden.⁵¹ The hijackers’ interaction with financial and training support demonstrated loose coupling. The sources of this support could and did change as required without consequence to

the hijackers, as the loose coupling ensured multi-way chains to complete their tasks. Although highly dependant on this support, the hijackers were not dependent on a particular source. The cell was not directed by supporting agents or al Qaeda's leaders but rather enabled by them.

Following the attacks of September 11th, al Qaeda's capability was significantly degraded by attacks from the United States and its allies.⁵² However, Complexity Theory informs us that complex networks are resilient and will survive attacks on its constituent parts. Al Qaeda's resilience is demonstrated by its ability to withstand attacks on financial and operational capabilities and continue to spawn new acts of terror. A Council on Foreign Relations report concluded that banking regulations and the regulation of Muslim charities in many countries in Southeast Asia, the Middle East and Africa are insufficient to identify and defeat terrorist financing.⁵³ A State Department report released in December 2002 acknowledged that al Qaeda continued to raise money and attract recruits.⁵⁴ The FBI estimated that several hundred militants linked to al Qaeda operate within the Untied States.⁵⁵ According to a top FBI official in Iraq, the terrorist network has now expanded its operations by attacking US and coalition forces in Iraq.⁵⁶ One Pakistani intelligence officer concluded, "al Qaeda isn't just surviving, it is planning new attacks all over the world, wherever it can strike."⁵⁷ The terrorist attacks since 9/11 in Bali, Turkey, Algeria and Saudi Arabia, and the presence of a vast array of terrorists operatives in Iraq, as well as the recent increases in terrorist threat levels in the US and the cancellation of several Air France flights to the US in December 2003, are tangible reminders of the global terrorist network's operational capability. Two years after military operations began against al Qaeda in Afghanistan, the CIA still identifies terrorism as the single greatest threat to US security.⁵⁸ The global terrorist network appears decidedly resilient to attacks against its component parts, and it is not simply "on the run".

SOURCES OF AL QAEDA'S FITNESS

There is a new phenomenon of increased hostility of Muslims against America. Not only Arab Muslims, but non-Arab Muslims who believe America is the reason for many problems in the Muslim world . . .⁵⁹

—al Fagih, PBS Frontline

The popularity of al Qaeda's goals combined with the lack of alternatives provides for its continued emergence, while its diverse levels of interdependencies provide for its resilience. The global Islamic anti-American terrorist network is tremendously fit. Al Qaeda has three sources of fitness: first, several of al Qaeda's objectives are shared by a multitude of Muslims

and Arabs; second, al Qaeda is comprised of a verity of tight, moderate but primarily loosely coupled aggregates and lastly, al Qaeda benefits from the absence of effective alternatives to extremism.

To illustrate the shared objectives, on September 11, 2001 Americans watched in disbelief as tens of thousands of people across the Middle East flooded the streets to celebrate the attacks on the World Trade Center and Pentagon. Although most Middle East experts unequivocally state that few Muslims accept the legitimacy of terrorism, they nonetheless concede the broad support for the bin Laden's goals. Bin Laden articulated these goals in his 1998 manifesto which said, "America must know that that the battle will not leave its land, God willing, until America leaves our land, until it stops supporting Israel, until it stops the blockade [now occupation] against Iraq.⁶⁰ President Bush and many within his administration repeatedly emphasized that the al Qaeda represents a small minority of Muslims that hate freedom and the American way of life. The reality is much more sobering, as many of bin Laden's objectives are not extreme but main stream. Several of al Qaeda's interests coincide with those of a great multitude of Arabs and Muslims who oppose to US Middle East policies. The four common interests that fuel the emergence of al Qaeda which are now covered in greater detail are: opposition to US military presence in Saudi Arabia, US support of repressive regimes in the Middle East, US policies toward Iraq and perceived US support of Israel at the expense of Palestinians.

Many Muslims oppose the US military presence in Saudi Arabia. As one Middle East expert reported, "even liberals in Saudi Arabia are against the American military presence."⁶¹ Another Mid-East analyst concluded that the presence of US forces in Saudi Arabia is religiously unacceptable even among moderate Muslims.⁶² Bin Laden's fiery speeches against the US "occupation" of Saudi Arabia during the Gulf War sold a quarter of a million cassettes.⁶³ During the recent war with Iraq, this support was not lost on the ruling Saudi Royal Family, as they severely limited the over flight of coalition aircraft and Turkey would not allow the staging of US invasion forces in their country.

The US has consistently supported several repressive regimes throughout the region for decades including monarchies and military dictatorships. Both the totalitarian dictator in Uzbekistan and the military dictator in Pakistan benefit from US support for their cooperation against al Qaeda and the Taliban.⁶⁴ Several US supported regimes throughout the region are identified by Amnesty International as human rights violators.⁶⁵ Most Arabs clearly see the hypocrisy of US policy of promoting democracy while bolstering repressive regimes.⁶⁶ Yousef al Khoei, the head of a moderate Islamic foundation concluded that terrorist organizations "appeal

to the disenfranchised Muslims everywhere who see the double standard of the United States.”⁶⁷

Many Muslims and Arabs believe that the US and UN imposed sanctions against Iraq following the first Gulf War only resulted in the suffering of the Iraqi people rather than punishing Saddam Hussein’s regime.⁶⁸ The United Nations children’s organization (UNICEF) reported that thousands of Iraqi children died each month as a result of sanctions against Iraq while they seemed to have little effect on the regime.⁶⁹ The first accurate public opinion poll taken in Iraq (by a British company in Nov 2003) discovered that the vast majority of more than 32,000 respondents sited that the fall of Saddam’s regime was the best thing that ever happened in their lives, but paradoxically, they also responded that the US invasion of their country was the worst thing that had happened to them.⁷⁰ The same poll showed that more than four out of five Iraqi’s have no trust or confidence in the US led coalition.

The US has provided military, economic and political support to Israel for decades. Even moderate Arabs and Muslims perceive the US support of Israel as having an anti-Arab and Muslim bias.⁷¹ Several Middle East experts agree that the strong US support of Israel over the Palestinians has created an equally strong anti-Americanism among Arabs.⁷² Terrorist expert and author of *Inside Al Qaeda*, Rohan Gunaratna, concluded that although most Muslims do not support political violence there is nonetheless “wide spread resentment” of America’s role in the Middle East and “especially political, economic and military support of Israel.”⁷³ The US national strategy to defeat terrorism recognized that finding a solution to the Israeli-Palestinian issue is a central component in combating terrorism.⁷⁴

The demography of Islamic based terrorist organizations provides evidence of the broad acceptance of the four pan Islamic and Arab interests articulated by bin Laden. The profile of today’s terrorists is as broad as the Muslim world as they are young, Muslim, male, and come from a variety of cultures and nations.⁷⁵ Many are highly educated doctors, lawyers, and engineers representing a cross section of the socio-economic strata.⁷⁶ Diversity among its members suggests an expansive base of popular support for al Qaeda’s objectives. Worse yet, the CIA concluded that its potential pool of recruits is growing.⁷⁷ Over the next 25 years the Middle East population is projected to double, thereby providing al Qaeda with an expanding pool of potential supporters.⁷⁸

The second element of fitness of al Qaeda’s self-organizing characteristic centers in Al Qaeda possessing a variety of tight and moderately coupled interrelationships, but it is predominately loosely coupled. Al Qaeda’s multitude of loosely coupled aggregates contributes to its recuperative capabilities. The terrorist network benefits from many levels of

interrelationships from tightly coupled terrorist cells, to a moderately coupled financial institution and loosely coupled individual donors. The relative size of the populations of loose, moderate and tightly coupled portions of the al Qaeda networks, as it corresponds to degree of correlation and range of activities are portrayed in Figure 1 on the next page. Although all the agents within the network are neither hierarchical nor possessed of only one form of coupling, it is accurate to describe the population of network as primarily loosely coupled.⁷⁹ Estimates on the number of al Qaeda operatives range from a few thousand to tens of thousands, but this represent a small fraction of the total population. Support for terrorism also includes a multitude of loosely coupled activities and a lesser number of moderately coupled activities ranging from: willful negligence, passive resistance to local authorities, non-cooperation with US and coalition forces, monetary support of dubious charitable organizations, extremist schools and Mosques, direct financial donations, resistance to banking reforms, drug trafficking, sanctuary for individual operatives, logistical support and an exhaustive list of other non-violent activities that either directly or indirectly support the terrorist networks. These larger segments of loosely and moderately coupled aggregates are characterized by lesser degrees of correlation and interdependence. Furthermore, as evidenced by the emergence of the 9/11 plot, the tightly coupled terrorist cells emerge from the ranks of the loosely coupled sympathetic. It is the variety and size of these moderate and loosely coupled segments that provides al Qaeda with its recuperative and propagative fitness.

The third element of fitness is the absence of alternatives, as national governments in the region are either unwilling or unable to employ their political, economic or military power to assuage these pan-Islamic interests and thereby reduce al Qaeda's emergence.⁸⁰ Many of these regimes lack the willing support of their own populations, and Islamic extremist groups offer the only sources for organized opposition to regimes many view as illegitimate.⁸¹ Other than the terrorist and political Islamic extremist organizations there are no alternative venues for effective opposition to US policies.⁸²

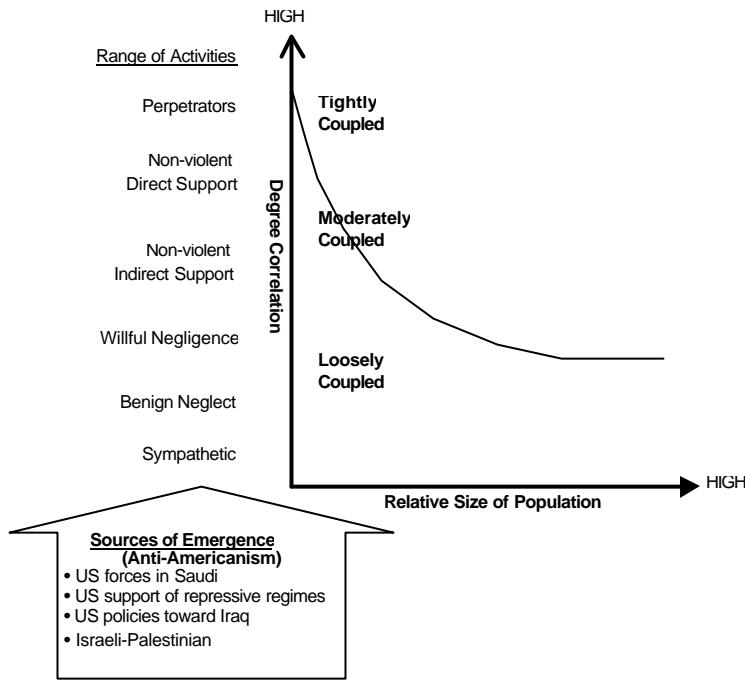


FIGURE 1 REALATIVE SCOPE OF ACTIVITIES TO COUPLING AND CORRELATION

RECOMMENDATIONS FOR US STRATEGY

There are legions of young men who seethe with resentment at America and its power . . . long after Mr. bin Laden has faded into history, they seem likely to form a ready pool of recruits for messianic leaders.⁸³

—John Burns
New York Times

The goals and objectives articulated in the current US strategy are all necessary elements to disrupt future acts of catastrophic terror against the US homeland.⁸⁴ However, attacking the constituent parts of the al Qaeda network will not by itself defeat it. The elements of Al Qaeda's fitness ensure that it will survive even the deaths of its most celebrated leaders and loss of its sanctuaries. Highlighting the latter, Deputy Secretary of Defense, Paul Wolfowitz,

testified that the training and planning that occurred in the US and Europe in preparation for the 9/11 attacks were far more devastating than the activities that took place in the Afghanistan camps.⁸⁵ Other than recognizing the importance of the Israeli – Palestinian conflict in “winning the war of ideas,” the US strategy does not address the other three sources of emergence, nor does the strategy recognize the criticality of the loosely coupled aspects of the network to al Qaeda’s overall fitness. Although the current strategy proposes strengthening the ability of weak states to battle terrorism and coercing the cooperation of states unwilling to support the war on terrorism, the strategy has no provisions for strengthening legitimate alternatives to terrorism in achieving popular pan-Islamic interests. The current US strategy must expand its goals and objectives to directly address the elements of al Qaeda’s fitness.

A primary goal in the US strategy to defeat terrorism, based upon al Qaeda’s fitness, must include diminishing the loosely coupled segments of the al Qaeda network. Al Qaeda’s fitness emanates from bin Laden’s tightly coupled inner circle to the loosely coupled cells that proliferate his ideology in the Mosques and coffee houses. Sympathy for bin Laden’s goals provides massive support for terrorism and creates an atmosphere of anonymity by which the network flourishes. As with most terrorist organizations, al Qaeda emerged from the politically weak and disenfranchised to provide a means for these people to achieve their political objectives.⁸⁶

A strategy that diminishes the multitude of loosely coupled agents and aggregates that support the al Qaeda network will make it less fit. The loosely coupled portion of the network provides the pool of agents that migrate through the process of correlation to increasing levels of terrorist support. Therefore, diminishing the pool of agents, which fuels the emergence will cause corresponding (albeit non-linear) constriction in some lesser number of moderately coupled elements of the network. The resultant decrease in the loosely coupled portions of the network will reduce the recursive element of al Qaeda’s self-organizing dynamic. Lower levels of loose and moderately coupled aggregates will make the network more vulnerable to attacks on its constituents. As stated previously, the tighter the network dependencies, the more vulnerable it is for disruption. Lesser proportions of loosely and moderately coupled agents will make the entire network more vulnerable and less resilient to attacks on any of its entities. Constriction of the al Qaeda network will facilitate the other elements of the US strategy, particularly the military and economic. Although diminishing the population of loosely coupled agents is unlikely to create a significant reduction in violent perpetrators (due to the extremely small population required relative to the overall sympathetic population), military operations to locate and destroy terrorists and their safe havens and mechanisms to find and disrupt terrorist

finance will benefit from a terrorist network that is constricted to increasingly dependant interrelationships. Likewise, military and economic successes will further deter and constrict the emergence of new entities. Unfortunately, constricting the terrorist network will not be easy or quick.

A strategy to diminish the loosely coupled segment of the terrorist network will have to accomplish two objectives: first, the strategy must identify, foster and enable alternative structures or networks that compete against terrorism and second, the strategy needs to redress the four sources of anti-American sentiment. A graphic representation of the desired effect of this two-fold strategy on the terrorist network appears in Figure 2 (Desired Effect of Strategic Enhancements) and is now described more fully.

The US must identify, foster and enable any structures that provide non-violent alternatives to terrorism. Proliferating and strengthening non-violent alternatives to terrorism will constrict the al Qaeda network. Alternative non-violent networks capable of effectively satisfying common need preferences of Muslims will attract more constituents than a terrorist organization for the simple reason that interrelationships with the terrorist network poses greater individual risk and requires higher levels of correlation. Alternative structures could include a variety of different organizations such as multilateral and international organizations, moderate Islamic religious groups, non-governmental agencies and national governments. The essential quality of these organizations is their individual or combined ability to employ political, economic or informational powers to redress the sources of al Qaeda's emergence. The US should quietly support and connect these structures as a network to compete against al Qaeda. Although it is unlikely that such structures would dissuade the relatively few "true believers" who are committed to violence against the US, it would make them more vulnerable to attack. Military and economic aspects of the current deterrence strategy in turn would increase the risks of supporting terrorist organizations and contribute to the attractiveness of alternative non-violent structures.

To accomplish the second strategic objective of reducing the four sources of anti-American sentiment, the US must focus all its elements of power together with the international community to establish policies that diminish the sources of al Qaeda's emergence. Specifically, the US and its allies must work to find a solution to the Israeli – Palestinian conflict. The current US strategy to combat terrorism recognizes, "that no other issue has so colored the perception of the United States."⁸⁷ The US can not afford unconditional support for repressive regimes in return for cooperation in fighting terrorism. Unconditional support for repressive regimes increases emergence of new terrorist entities and is counterproductive to the goal of

defeating the network. The US should continue to support the counter terrorism efforts of its Middle East allies, while simultaneously strengthening political reform, economic assistance and educational programs. These policies will increase the legitimacy of the governments in the region, serve to further isolate the terrorist network, and establish these governments as alternatives to terrorism. Finally, the establishment of a stable Iraqi government, which has the willing support of its population and a subsequent withdrawal of US forces from both Iraq and Saudi Arabia, will help ameliorate anti-American ideology. Combined with the current aspects of US strategy, these four strategic objectives will form a more holistic strategy to defeat the anti-American global network of Islamic terrorism.

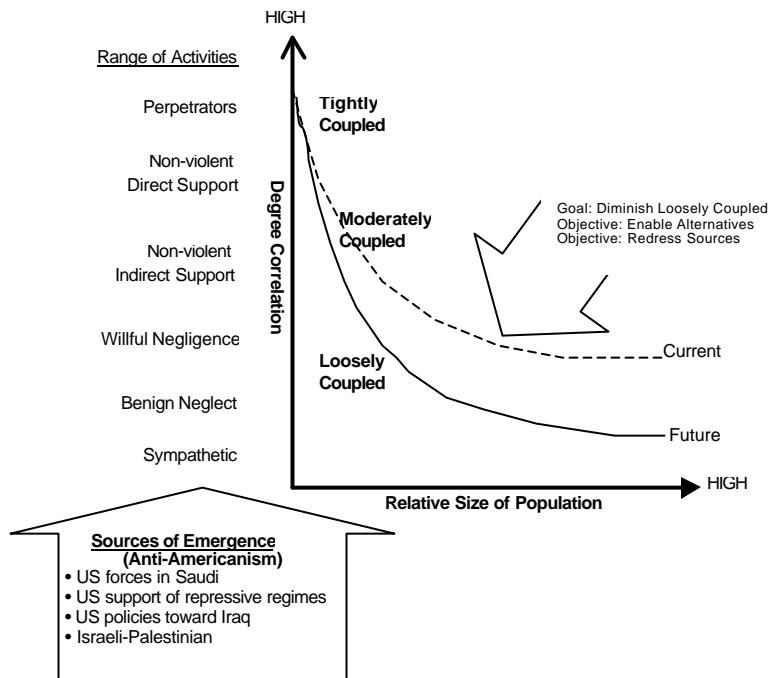


FIGURE 2 DESIRED EFFECT OF STRATEGIC ENHANCEMENTS

CONCLUSION

The evidence provided by this examination of al Qaeda's behaviors clearly supports the proposition that global terrorism is a complex dynamic network. Al Qaeda is more accurately described as part of a global network of interdependent agents who display emergent, self

organizing and resilient characteristics. Al Qaeda's fitness is fueled by a multitude of Muslims and Arabs who are sympathetic to its goals and arrayed in a variety of tight, moderate, but primarily loosely coupled entities. The lack of effective alternatives to terrorism contributes to this network's fitness. The current elements of the US strategy to directly defeat the efforts of terrorists are necessary components in limiting or disrupting the terrorist network. However, no US counter terrorism strategy will long succeed without reducing the sources from which the terrorist network emerged and without diminishing the loosely coupled aggregates that support it. To defeat al Qaeda the US must diminish the loosely coupled segments of the network to attack the network's emergent, self-organizing and resilient characteristics. To accomplish this goal the US must strengthen alternative structures that effectively compete against al Qaeda in meeting the need preferences of Arab Muslims. This strategy combined with policies aimed at diminishing the four sources of anti-Americanism, will increase the network's isolation and make it more vulnerable to the elements of the current strategy.

WORD COUNT= 5,908

END NOTES

¹ Carl Von Clausewitz, *On War*, (New York, N.Y.: Knopf, 1993), 100.

² Daniel Byman and Mohammed el Barabei, "Scoring the War on Terrorism", *National Interest*, no. 72 (Summer, 2003): 75 [database on-line]; available from ProQuest; accessed 25 September 2003.

³ George Tenet, "Testimony Before Joint Inquiry Into Terrorist Attacks Against the United States", 18 June 2002; available from http://www.cia.gov/cia/public_affairs/speeches/2001; Internet; accessed 28 November 2003.

⁴ George W. Bush, *Progress Report on the Global War on Terror*, (Washington D.C.: The White House, September 2003); available <http://www.state.gov/document/organization/24268.pdt>; Internet; accessed 28 November 2003. See also Tenet 2002 Testimony.

⁵ M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York N.Y.: Simon and Schuster, 1992), 12-13. The Santa Fe Institute founded in the mid 1980's sought to develop alternative theoretical frameworks to what they described as the dynamic nonlinear systems. The collection of Nobel laureates, physicists, economists, biologists and others came together to understand the spontaneous self-organizing dynamics they observed in world around them. The founder George Cowan and first president of the institute described its purpose: "We believed that they were forging the first rigorous alternative to the kind of *linear reductionist* [emphasis added] thinking that has dominated science since the time of Newton."

See also Mary Jo Hatch, *Organization Theory: Modern, Symbolic and Post Modern Perspectives* (Oxford University Press: 1997), 4-7. Hatch, a professor of organizational theory described four phases of organizational theory. She described the "modern" period of organizational theory as founded upon the scientific method and characterized by linear and hierarchical organizations of the industrial era. In the modern perspective of organizational theory, phenomena are tested with specific criteria and empirical evidence is used to support propositions.

See also Major Darfus L. Johnson, "Center of Gravity: The Source of Operational Ambiguity and Linear Thinking in the Age of Complexity", Monograph, (Fort Leavenworth: School of Advanced Military Studies, 16 December 1998), 5. Johnson's monograph described the US doctrinal concept of "center of gravity" as a reductionist methodology that produced ambiguity and misunderstanding when applied to threats or adversaries that are distinctly non-linear.

⁶ Joint Chiefs of Staff, *Doctrine for Joint Operations*, Joint Pub 3-0 (Washington D.C.: U.S. Joint Chiefs of Staff, 10 September 2001), III-22.

⁷ Major Darfus L. Johnson, "Center of Gravity: The Source of Operational Ambiguity and Linear Thinking in the Age of Complexity", Monograph, (Fort Leavenworth: School of Advanced Military Studies, 16 December 1998), 5.

⁸ James N. Rosenau, "Damn Things Simultaneously: Complexity Theory and World Affairs", *Complexity, Global Politics and National Security*, (National Defense University, Washington D.C: 1997); available from www.ndu.edu/inss/books%20-%201998/Complexity,%20Global%20Politics.htm; Internet; accessed 28 October 2003.

⁹ Clausewitz, 152.

¹⁰ Andy Ilanchinski, "Land Warfare and Complexity, Part II: An Assessment of the Applicability of Nonlinear Dynamics and Complex Systems Theory to the Study of Land Warfare," Center for Naval Analyses, July 1996, 22. See also Waldrop, 145.

¹¹ James Moffet, *Complexity Theory and Network Centric Warfare*, (Washington D.C.: Department of Defense Command and Control Research Program, September 2003): quote in forward by Henrik Jeldtoft Jensen, xi.

¹² Waldrop, 329.

¹³ Russ Marion and Mary Uhl-Bien, "Complexity Theory and Al-Qaeda: Examining Complex Leadership", Presented at Managing the Complex IV: A Conference on Complex Systems and the Management of Organizations, Fort Meyers, FL Dec. 2002; available from http://www.isce.edu/site/Marion_Uhl-Bien.pdf; Internet; accessed 12 October 2003.

¹⁴ Ilanchinski, 17.

¹⁵ Waldrop, 46, 63-64. Waldrop explains how the computer age was instrumental in the emergence of complexity theory, "economists could not only follow the entire process by which one outcome emerged, they could see mathematically how different sets of historical accidents could cause radically different outcomes to emerge." It was the proliferation of computers and increasing computational capability that promoted the "new sciences." Scientists were increasingly able to study more complex systems because they could. Equations with trillions of variables and inputs could now be contemplated. What they found was that even the smallest change in these huge simulations could have dramatically different outcomes. Partly due to computers, physicists began in the 1980s to recognize that these complex behaviors could be understood in a new powerful theory known as "nonlinear dynamics."

¹⁶ Jensen as quoted in Moffet, xi.

¹⁷ Waldrop, p. 62. Waldrop explains the development and origins of Complexity Theory. Waldrop described the role of George Cowan, the first president of the Santa Fe Institute who sought to bring together the foremost authorities on a wide range of academic disciplines. A former member of the President's White House Science Council, Cowan and his associate scientists were faced with a broad range of topics which defied a single disciplined approach to complex issues. He and his associates had spent a lifetime becoming ever more specialized, however, these issues demanded a broader understanding. Cowan believed that over the previous years he suspected that the old reductionist methods were unable to address the complexities of the real world.

¹⁸ Russ Marion, *The Edge of Organization: Chaos and Complexity Theories of Formal Social Systems* (London, United Kingdom: Sage Publications, 1999), 29, 31. See also Marion and Uhl-Bien, "Complexity Theory and Al-Qaeda". See also Stuart Kauffman, *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity* (New York Oxford University Press, 1995), 23-24. Kauffman, a pioneer in Complexity Theory describes the emergent and self-organizing characteristics of biological organisms and hypothesizes its applicability to all complex adaptive systems.

¹⁹ Kauffman, 24. and Jensen as quoted in Moffet, xiii.

²⁰ Kauffman, 23-25, 71. and Ilachinski, 22. Describing the self-organizing nature of complex systems Kauffman coined the now famous phrase “order is for free.”

²¹ Holland as quoted in Waldrop, 145.

²² Marion and Uhl-Bien, “Complexity Theory and Al Qaeda”.

²³ Marion, *Edge of Organization*, 159-160.

²⁴ J.H. Holland *Hidden Order* (Reading Massachusetts: Addison-Wesley, 1995), 11.

²⁵ Marion, “Complexity Theory and Al Qaeda.

²⁶ Ibid.

²⁷ Ibid.

²⁸ Holland as quoted in Waldrop, 145.

²⁹ Marion, *The Edge of Organization*, 161.

³⁰ Ibid, 162.

³¹ Ibid., and Marion and Uhl-Bien, “Complexity Theory and Al Qaeda”.

³² Ilachinski, 18. and Kauffman, 27, 169-170. See also Marion, Uhl-Bien, “Complexity Theory and AL Qaeda.” and Marion, *The Edge of Organizations*, 162. Although each author defines the elements of network fitness slightly differently all conclude that fit structures must have a multitude of interacting agents that display a diversity of self-organizing interrelationships (loose, moderate and tightly coupled systems).

³³ Ilachinski, 18. See also Marion, *The Edge of Organizations*, 164.

³⁴ Marion, *The Edge of Organization*, p.162. Marion describes six elements of a fit organization from a complexity perspective. This author has adopted one of Marion’s elements of fitness that says, “The component parts of fit systems are interrelated in ways that allow them to dissipate the impact of perturbations.” Marion, however sees this accomplished through networks that are comprised of predominately moderately coupled aggregates. This author defines fitness as the balance of loss, tight, and moderately coupled entities appropriate to its task and environment.

³⁵ Ibid p.161

³⁶ Tenet, 8.

³⁷ Peter Lance, *One Thousand Years for Revenge: International Terrorism and the FBI* (New York, NY: Harper-Collins, 2003), 259.

³⁸ Lance, 356, 383.

³⁹ Tenet, 3.

⁴⁰ Council on Foreign Relations, *Terrorist Financing: Report of Independent Task Force*, (New York N.Y.: Council on Foreign Relations Inc., 2002), 6.

⁴¹ Byman.

⁴² US State Department, "Patters of Global Terrorism," April 2001; available from <http://www.state.gov/s/ct/rls/pgtrpt/2000>; Internet; accessed 25 October 2003.

⁴³ James M. Smith and William C. Thomas, "The Terrorist Threat and US Government Response: Operational and Organizational Factors," (USAF Institute for National Security Studies, US Air Force Academy, Colorado: March 2001), 37.

⁴⁴ Steven Erlanger and Chris Hedges, "Terrorist Cells Slip Through Europe's Grasp," *New York Times*, 28 December 2001, p. 1.

⁴⁵ Ibid.

⁴⁶ Saad Al Fagih, "The Hunt for bin Laden," interviewed by Martin Smith, *PBS Frontline*, November 2001; available from <http://www.pbs.org/wgbh/pages/frontline/shows/binladen/interview/al-fagih.html>; Internet; accessed 17 November 2003.

⁴⁷ Ibid.

⁴⁸ Council on Foreign Relations, *Terrorist Financing*, 6-7.

⁴⁹ Tenet, 3.

⁵⁰ Ibid., 4.

⁵¹ Ibid. Tenet characterized the 9/11 plot as "resilient," and concluded, "in fact the plot went forward despite several real blows." See Tenet testimony for a detailed description of the many challenges that the terrorist network overcame to complete the attacks on the World Trade Center.

⁵² Bush, *Progress Report on the Global War on Terror*. US forces have made Afghanistan untenable as an al Qaeda base from which to plan, train and organize terrorist operations. Thousands of its members were killed or captured and others were dispersed and forced into hiding. Many of al Qaeda's most talented and critical members of its leadership were captured or killed to include Mohammed Ataf, Khalid Sheikh Mohammad, and Rami Bin al Shibh to name but a few. Men whose experience and expertise has been developed over years of conflict can't be easily replaced.

⁵³ Council on Foreign Relations, *Terrorist Financing*, 22. Even with global support for the war on terrorist financing, (expressed in the UN resolutions) finding and destroying the myriad sources of terrorist funding is extraordinarily difficult. Many countries within these regions lack either the necessary laws, regulations, or enforcement tools needed to counter terrorist finance networks as called for under UN resolution 1373. A fatal flaw in countries where most Muslims feel a religious obligation, called Zakat, to give at least 2.5 percent of their income to Islamic

charities. The laws in these regions allow a great degree of autonomy and anonymity in which terrorists can conduct financial transfers and within these same regions terrorist are more likely to find willing sympathizers. For example, the ancient Islamic Hawala financing system allows the anonymous transfer of capital without the actual physical transfer funds and without written records. The Council on Foreign Relations estimates that approximately seven billion dollars of virtually untraceable funds are transferred into the United States each year through Hawalanders. Furthermore, the Council reports that no countries, including the Untied States, effectively regulate Islamic Charities or the Hawala system. The weaknesses of these banking systems and regulations governing Islamic charities combined with diverse funding sources have ensured that global terrorist organizations will remain financial robust. Al Qaeda's financial network and organizational dynamic have proven to difficult to defeat.

⁵⁴ Byman.

⁵⁵ Ibid.

⁵⁶ Romesh Ratnesar, "Al Qaeda's New Home," *Time*, 15 September 2003, p.60.

⁵⁷ Ibid.

⁵⁸ White House, *Progress Report*, and Tenet 2003 Testimony.

⁵⁹ al Fagih

⁶⁰ Osama bin Laden, Statement, translated by Associated Press, 9 Oct 2001, available from http://www.users.skynet.be/terrorismhtml/laden_statement.htm; Internet; accessed 26 November 2003.

⁶¹ al Fagih.

⁶² Said Aburish, "The Hunt for bin Laden," interviewed by Martin Smith, *PBS Frontline*, November 2001; available from <http://www.pbs.org/wgbh/pages/frontline/shows/binladen/interview/aburish.html>; Internet; accessed 17 November 2003.

⁶³ Rex A. Hudson, "The Social and Psychology of Terrorism: Who Becomes a Terrorist and Why?" (Federal Research Division, Library of Congress: September 1999): 118; available from <http://www.loc.gov/rr/frd>; Internet; accessed 26 November 2003.

⁶⁴ As'ad Abu Khalil, *Bin Laden, Islam and America's New War on Terrorism*, (New York N.Y.: Seven Stories Press, 2002), 81.

⁶⁵ Amnesty International, *Amnesty International Annual Report 2003*, "Middle East and North Africa," [Journal on-line]; Available from <http://web.amnesty.org/report2003>; Internet; accessed 17 November 2003.

⁶⁶ Abu Khalil, 80-81.

⁶⁷ Simon Reeve, *The New Jackals* (North Eastern University Press: Boston, 1999), 203.

⁶⁸ Aburish.

⁶⁹ Abu Khalil, 80.

⁷⁰ Michael McDonough, "Poll, Iraqis Distrusting Coalition Troops," Associated Press, 1 December 2003; available from <http://story.news.yahoo.com/news> ; Internet; accessed 12 December 2003.

⁷¹ Abu Khalil, 93.

⁷² Ibid., 12.

⁷³ Rohan Gunaratna, *Inside al Qaeda* (Columbia University Press: New York, 2002), 111.

⁷⁴ George W. Bush, *National Strategy for Combating Terrorism* , (Washington D.C.: The White House, February 2003). 24.

⁷⁵ Hudson, 43.

⁷⁶ Ibid., 116, 119.

⁷⁷ See Tenet 2002 Testimony.

⁷⁸ John Martin, "The Population Time Bomb," *Middle East* 339 (November 2003): 6. [data base on-line]; available from ProQuest; accessed 15 December 2003.

⁷⁹ Brian Jenkins, "Countering al Qaeda," (Santa Monica, RAND: 2002), 12. Jenkins characterized al Qaeda's current mode of operations following the 9/11 attacks as a looser al Qaeda network that is better able to survive intense international pressures.

⁸⁰ Abu Kahil, 31, 40, 79.

⁸¹ Ibid., 31.

⁸² Aburish. "There is nothing else in Saudi Arabia at this moment in time in terms of political movements, except Islamic fundamentalism."

⁸³ John Burns, "A Nation Challenged," *New York Times*, Jan 27 2002, 1A, p. 3.

⁸⁴ Bush, *National Strategy for Combating Terrorism* , 15-28. The US strategy for combating describes four goals: first, defeat terrorists and their organizations; second, deny sponsorship, support and sanctuary; third, defend US citizens at home and abroad and lastly, diminish underlying conditions that terrorists seek to exploit. The last goal (which is most relevant to this author's assessment of the al Qaeda's network fitness) has two objectives: first, to "partner" with other countries to strengthen weak states and diminish underlying conditions that support terrorism and second, to "win the war of ideas." The latter objective is described as "de-legitimizing" terrorism, to establish an international norm for non-tolerance of terrorism and lastly finding a solution to the Palestinian issue. There is no mention of diminishing the sources of anti-Americanism (except for the Israel-Palestinian conflict).

⁸⁵ Byman.

⁸⁶ Harold A. Gould and Franklin Spinney, "Fourth Generation Warfare is Here!", *Center for South Asian Students Newsletter*, (University of Virginia, Fall 2001), [journal on-line]; available from <http://www.virginia.edu/soasia/newsletter/fall02/warefare.html>; Internet; accessed 11 October 2003.

⁸⁷ Bush, *National Strategy for Combating Terrorism*, 24.

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